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ABSTRACT

Twenty-eight rural elementary teachers showed positive changes in attitude toward perceived competencies in teaching physical sciences and students showed statistically significant cognitive gains as a result of teacher participation in a 4-month project. Teachers attended four workshops, hosted three on-site visits by university science educators, developed instructional units, and shared accomplishments with a variety of audiences. A 44-statement Likert-type pre- and post-opinionnaire measured teacher attitudes toward perceived competencies in areas of content, curriculum and methodology in the physical sciences. A correlated t-test between differences in means was calculated for opinionnaire statements. Teachers administered a pre- and post-test to their science classes to assess student cognitive gains and a paired t-test was used to calculate differences in means for each class. Teachers showed gains in perceived competencies in knowledge and utilization of inquiry/process skills, curriculum, methodology, classroom management, computers, and metric measurement. Study results indicate that coordinated efforts between rural school districts and universities to improve science teaching in elementary schools need greater emphasis on helping teachers organize their thoughts and activities around concepts in science. Tables provide correlated t-test scores for teacher opinionnaires. (LFL)

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ATTITUDE CHANGES OF TEACHERS INVOLVED IN A PROJECT FOR THE IMPROVEMENT OF PHYSICAL SCIENCE INSTRUCTION IN RURAL ELEMENTARY SCHOOL

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ATTITUDE CHANGES OF TEACHERS INVOLVED IN A PROJECT FOR THE IMPROVEMENT OF PHYSICAL SCIENCE INSTRUCTION IN RURAL ELEMENTARY SCHOOLS

Abstract

The purpose of this study was to explore changes in teacher attitudes toward their perceived competencies in teaching science after participating in a project which provided opportunities to acquire important concepts and information in the physical sciences and to develop effective instructional strategies for teaching those physical science concepts to elementary level students. The participants attended four concentrated workshops, hosted three on-site visits from university science educators, developed practical instructional units, and shared their accomplishments with a variety of audiences. Additionally, collection of data to assess cognitive gains on the part of students as a result of teacher participation in the project was requested from participants.

The questions asked were:

(1. Do elementary classroom teachers' attitudes toward their perceived competencies in teaching science change in a positive direction following participation in this project?

(2. Is there a significant difference in attitudes toward perceived competencies in knowledge and utilization of inquiry/process skills, curriculum, methodology, classroom management, computers, and metric measurement for participants in the project to improve physical science instruction?

(3. Do students in the science classes of participants make significant cognitive gains as a result of teacher participation in the inservice project?

The subjects of this study were 28 elementary level classroom teachers, i.e., teams of three (3) elementary teachers from nine (9) rural school districts and one(1) elementary teacher from one (1) rural school district. A pre- and post-opinionnaire was designed to measure the attitudes of elementary teachers towards their perceived competencies in the areas of content, curriculum, and methodology in the physical sciences. A correlated t-test between differences in means was calculated for the statements on the opinionnaire. Additionally, at the conclusion of the project, each participant was asked to administer a pre- and post-test to their science class(es) to assess the cognitive gains on the part of students as a result of teacher participation in the project.

Responses indicated positive changes over the four month period of the project. There were statistically significant changes in a positive direction toward perceived competencies in knowledge and utilization of inquiry/process skills, curriculum, methodology, classroom management, computers and metric measurement. Statistically significant ($p<.005$) gains measured by a paired t-test were noted on each of the twelve (12) cognitive pre- and post-tests administered to studednts and returned by course participants.

The results of this study indicate that coordinated efforts between rural school districts and universities to improve science teaching in the elementary schools need a greater emphasis on helping teachers organize their thoughts and activities around concepts in science. A combination of activities including inservice workshops, on-site visitations by university personnel, and developing instructional units for dissemination contributes to improvement of attitudes toward perceived competencies in teaching elementary science as well as increasing cognitive gains on the part of students in participants' science classes.

ATTITUDE CHANGES OF TEACHERS INVOLVED IN A PROJECT FOR THE IMPROVEMENT OF PHYSICAL SCIENCE INSTRUCTION IN RURAL ELEMENTARY SCHOOLS

Purpose of Study

The purpose of this study was to explore changes in teacher attitudes toward their perceived competencies in teaching science after participating in a project which provided opportunities to acquire important concepts and information in the physical sciences and to develop effective instructional strategies for teaching those physical science concepts to elementary level students. The participants attended four concentrated workshops, hosted three on-site visits from university science educators, developed practical instructional units, and shared their accomplishments with a variety of audiences. Additionally, collection of data to assess cognitive gains on the part of students as a result of teacher participation in the project was requested from participants.

The questions asked were:

(1. Do elementary classroom teachers' attitudes toward their perceived competencies in teaching science change in a positive direction following participation in a project which includes the following components: (1 concentrated workshops, (2 on-site visits from science educators and (3 development of instructional units?

(2. Is there a significant difference in attitudes toward perceived competencies in knowledge and utilization of inquiry/process skills, curriculum, methodology, classroom management, computers, and metric measurement for participants in the project to improve physical science instruction?

(3. Do students in the science classes of participants make significant cognitive gains as a result of teacher participation in the inservice project?

Theoretical Basis for Study

Colleges and universities generally acknowledge but rarely address the needs of small and rural schools. Two studies have identified regional and national needs of small and rural schools. These needs include: (1 technical assistance in how to apply and compete for funds, (2 the development of a communication network for sharing information among schools, (3 preservice and inservice training programs to develop skills and knowledge, (4 assistance in the use of computers and other technology to improve instruction and administrative services (5 improvements in the curricula, and (6 the development and use of appropriate energy conservation measures (National Seminar on Rural Education, 1979, Regional Rural Roundtable, 1980).

Other needs identified in research projects include staff development activities, innovative methods of recruiting and retaining teachers, delivery systems that enable teachers to add specializations to their present fields of certification, and developing and utilizing public relations practices (Beck and Smith, 1982; Seifert and Simone, 1981).

The focus of this project was on curriculum and instruction in several of the need areas detailed above. Small school districts simply cannot afford to hire full-time subject matter specialists to improve their curricula and to systematically supervise the instructional program.

The foundation for understanding secondary and college level science concepts is established in our elementary schools. Unfortunately, the latest research indicates that this important foundation in science concepts is not being established in Texas elementary schools. The State of Texas has most recently passed laws to help correct the situation, thereby agreeing with the national concern that there is a "need for educational change. . . .to increase pedagogical emphasis on integrating basic skills with conceptual understanding" (National Academy of Science, 1985).

The transcripts of graduating elementary teachers and graduate students in elementary education indicate that they have consistently avoided taking electives in the physical sciences during their university programs. This practice of "steering clear" of the difficult physical science courses in physics, chemistry, geology and astronomy has left many elementary teachers with conceptual gaps in these areas. To help elementary teachers (and their students) improve this situation, new laws have been written in Texas and throughout the United States.

TABLE 1
CORRELATED t-TEST BETWEEN DIFFERENCES IN MEANS

Variable	N	Mean	S.D.	Diff Mean	t-value	df	2-Tail Prob
Total Attitude Inquiry/Process Skills Pre	28	3.026	.595				
				1.051	11.789	27	p<.0005
Total Attitude Inquiry/Process Skills Post	28	4.077	.508				
Total Attitude Curriculum Pre	28	2.946	.539				
				.959	12.382	27	p<.0005
Total Attitude Curriculum Post	28	3.906	.438				
Total Attitude Methodology Pre	28	3.255	.953				
				.918	4.590	27	p<.0005
Total Attitude Methodology Post	28	4.173	.969				
Total Attitude Management Pre	28	3.403	.670				
				.658	6.58	27	p<.0005
Total Attitude Management Post	28	4.061	.511				
Total Attitude Computers Pre	28	2.393	1.141				
				1.167	7.075	27	p<.0005
Total Attitude Computers Post	28	3.560	.925				

Procedure of Study

The subjects of this study were 28 elementary level classroom teachers, i.e., teams of three (3) elementary teachers from nine (9) rural school districts and one (1) elementary teacher from one (1) rural school district. Project participants were selected by their respective school districts using methods which ranged from volunteers who were then selected by chance to specific teachers who were asked by administrators to participate.

A 44-statement opinionnaire was designed to measure the attitudes of elementary teachers towards their perceived competencies in the areas of content, curriculum, and methodology in the physical sciences. The subjects responded on a Likert-type scale consisting of five categories, i.e., I feel I am thoroughly and completely competent, both in a general sense and in the related details to I feel no competency at all, either in a general sense or with respect to related details. The content validity of this measure was judged by three science educators. This instrument was administered at the beginning of the first workshop session and at the conclusion of the project. A correlated t-test between differences in means was calculated for the statements on the opinionnaire. At the conclusion of the four month project, participants were asked to administer a pre- and post-test to their science class(es) to assess the cognitive gains on the part of students as a result of teacher participation in the project. A paired t-test was used to calculate the differences between means for the cognitive pre- and post-tests for each class.

Results of Study

Responses indicated positive attitude changes over the four month period of the project. Seven variables including measures of pre- and post-attitudes of perceived competencies in science instruction and a sum total identified as a universe total were generated. A correlated t-test between differences in means was calculated and results are listed in Table 1. There were statistically significant changes in a positive direction toward perceived competencies in knowledge and utilization of inquiry/process skills, curriculum, methodology, classroom management, computers and metric measurement. The results of this study indicate that classroom teachers' attitudes toward their perceived competencies in teaching science are more positive following activities which include attendance at workshops, visitation by university personnel, and development of instructional units. Statistically significant ($p<.005$) gains measured by a paired t-test were noted on each of the twelve (12) cognitive pre- and post-tests administered to students and returned by course participants.

CORRELATED t-TEST BETWEEN DIFFERENCES IN MEANS

Variable	N	Mean	S.D.	Diff Mean	t-value	df	2-Tail Prob
Total Attitude Measurement Pre	28	2.905	.806				
				.964	6.804	27	p<.0005
Total Attitude Measurement Post	28	3.869	.750				
Universe Total Pre	28	3.085	.618				
				.934	9.76	27	p<.0005
Universe Total Post	28	4.018	.512				

Implications for Teaching Science

Coordinated efforts between rural school districts and universities to improve science teaching in the elementary schools need a greater emphasis on helping teachers organize their thoughts and activities around concepts in science. A combination of activities including inservice workshops, on-site visitations by university personnel, and developing instructional units for dissemination contributes to improvement of attitudes toward perceived competencies in teaching elementary science as well as increasing cognitive gains on the part of students in participants' science classes.

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